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# ***OAR Box 1214***

*Prepped by Ollie Stewart*

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**A-91-46**

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*November 27, 1991*

**Ms. Mary T. Smith, Director  
Field Operations and Support Division (EN-397F)  
U.S. Environmental Protection Agency  
401 M. Street S.W.  
Washington, D.C. 20460**

**Subject : Additional Details Relating to Toyota's Comments on the MMT Fuel Additive  
Waiver Request.**

*Dear Ms. Smith :*

As per the request of your department, please find enclosed additional information relating to Toyota's comments on the MMT fuel additive waiver request. This information includes additional details of Toyota's tests relating to the use of this additive as well as an explanation of the alternative durability cycle that was used for this program.

We believe that this data indicates that serious questions remain to be answered before MMT can be approved as an additive to gasoline. Emissions increases, degradation of catalytic converter efficiency, and the reduction of catalyst durability are among the results noted from Toyota's test program.

It remain Toyota's conclusion that the use of MMT causes deterioration of the emission control system resulting in an emissions increase. Further, the allowance of an MMT additive may have an adverse effect on a manufacturers ability to comply with more stringent emission standards in the future. Therefore, as noted in our previous comment, Toyota urges EPA to deny the waiver request from Ethyl on the grounds that such a waiver would have an adverse effect to automobile emissions.

We thank you for this opportunity to clarify our previous comments. If you have any questions regarding this matter, please feel free to contact Mr. Robert Babcock of my staff.

Sincerely,

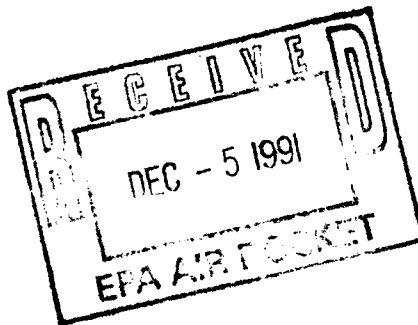
**Takao Niwa  
General Manager  
Emissions and Certification Dept.**

Enclosure



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

A-91-46  
IV-D-54



OFFICE OF  
AIR AND RADIATION

MEMORANDUM

SUBJECT: Toyota's November 27, 1991 Submission on MMT  
(attached)

FROM: David J. Kortum, Environmental Engineer  
Fuels Section

TO: Docket A-91-46 (LE-131)

*David J. Kortum*  
12/5/91

In regards to the attached November 27, 1991 submission from Toyota Technical Center, U.S.A., Inc., because the attachment referred to in the document on mileage accumulation driving cycle has been indicated by Toyota to be "Confidential", it has been omitted from this docket submission.

Attachment

# I. Mileage Accumulation / Emission Results

## 1. Test Method

At first, a test vehicle accumulated the mileage to 30,000 miles using gasoline with 1/32 grams per gallon MMT added. After that, the catalyst and oxygen sensors on the same test vehicle were replaced and the vehicle accumulated an additional 30,000 miles without the MMT additive.

## 2. Test Vehicle and Engine

*Vehicle* : '90MY Camry Sedan, 4A/T

*Engine* : 3S-FE (2.0L, L4)

*Emission Control System* : Multipoint Electric Fuel Injection + 2 Three Way Catalysts (Close-coupled and Under floor Catalysts) + 2 Oxygen Sensors

## 3. Test Fuel

### 1) Mileage Accumulation Test Fuel

<u>Fuel Characteristics</u>	<u>W/O MMT</u>	<u>W/ MMT</u>
MMT Additive	0	1/32 Mn g/gallon
RON	91.4	<
MON	81.5	<
RVP	9.9 psi	<
Distillation (°F)		
IBP	85	<
10%	119	<
50%	211	<
90%	343	<
EP	402	<
Olefins	6.8 v%	<
Aromatics	36.5 v%	<
Lead	0.0045 g/gal	<
Phosphorus	0.13 wt%	<

### 2) Emission Test Fuel

EPA certification test fuel

## 4. Mileage Accumulation Cycle

Durability driving cycle developed by Toyota.

A detail explanation of this driving cycle is shown in the Attachment.

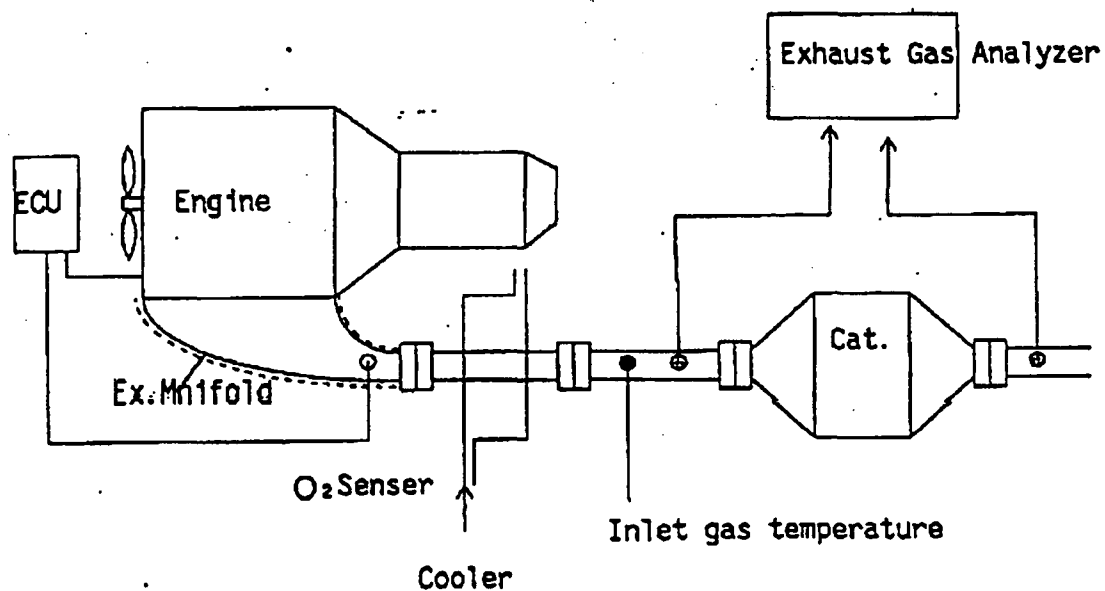
**5. The emission results obtained from the test program are shown in the following table.**

<b>Mileage (x10<sup>3</sup> miles)</b>		<b>0</b>	<b>5</b>	<b>10</b>	<b>15</b>	<b>20</b>	<b>30</b>
<b>THC</b>  <b>(g/mile)</b>	<b>W/ MMT</b>	0.115	0.181	0.225	0.213	0.229	0.253
	<b>W/O MMT</b>	0.137	0.144	0.143	---	0.166	0.158
<b>CO</b>  <b>(g/mile)</b>	<b>W/ MMT</b>	0.81	1.08	1.49	1.21	1.72	1.90
	<b>W/O MMT</b>	0.78	1.02	1.08	---	1.33	1.48
<b>NO<sub>x</sub></b>  <b>(g/mile)</b>	<b>W/ MMT</b>	0.095	0.124	0.183	0.153	0.145	0.175
	<b>W/O MMT</b>	0.073	0.173	0.115	---	0.210	0.152

## II. Catalyst Performance Evaluation Test (Catalyst Efficiency)

### 1. Test Condition

- 1) *Engine* : Toyota 3L L6 (Closed Loop Control)
- 2) *Driving Mode* : 2000 rpm and minus 350 mmHg load (catalyst space velocity = 46000 hr<sup>-1</sup>)
- 3) *Test Equipment* : See Schematic Below



**2. Catalyst Efficiency Test Results are Shown in the Following Table**

**Catalyst Conversion Efficiency (%)**

Temp. (C°)	<u>W/O MMT</u>			<u>W/ MMT</u>		
	HC	CO	NOx	HC	CO	NOx
201	1.5	2.6	0.7	1.1	3.1	2
301	5.8	5.3	11.5	4.8	4.1	7.9
312	8	10.1	21.9	6.3	4.7	13.2
321	12.4	24.4	45.2	7.3	6.9	16.2
331	40.2	54.6	77.6	11.8	16.4	31.7
341	74.8	77.8	89.1	31.4	40.2	57.1
350	83.9	85.7	90	56.2	60.5	77.2
360				75.4	73.2	80.9
370	89	86.2	97.1	86.3	78.2	84.5
380	91.5	91.7	96.2	89.9	80.6	85.8
390				92	83.3	87.9
400	92.5	92.6	96.9	93.6	88	88.8
438	94.2	91.8	97			
445				95.3	91.3	90

Sampling Position	Mn Deposits (wt %)	
	<u>W/ MMT</u>	<u>W/O MMT</u>
1	2.87	0
2	0.75	0
3	0.37	0
4	0.23	0